

**A NEW SPECIES AND SPECIES DISTRIBUTION RECORDS OF
NEOLEUCINODES (LEPIDOPTERA: CRAMBIDAE: SPILOMELINAE)
FROM COLOMBIA FEEDING ON *SOLANUM* SP.**

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Abstract.—*Neoleucinodes silvaniae*, n. sp., from Colombia, is described. The larvae feed on the fruit of wild *Solanum lanceifolium* Jacq. Adults and larvae of the new species are figured. The new species is compared to *Neoleucinodes elegantalis* (Guenée), a major pest of tomatoes throughout South America. *Neoleucinodes prophetica* (Dyar), *N. imperialis* (Guenée), and *N. torvis* Capps are reported from Colombia for the first time.

Key Words: Colombia, *Solanum*, Solanaceae, larvae, morphology

Neoleucinodes elegantalis (Guenée, 1854), the tomato fruit borer, causes economic loss throughout South America in crops of solanaceous vegetables including tomato, *Solanum lycopersicum* L., eggplant, *Solanum melongena* L., pepper, *Capsicum annuum* L., and tropical solanaceous fruits such as the tomato tree, *Solanum betaceum* Cav., and naranjilla, *Solanum quitoense* Lam. In Colombia *N. elegantalis* was the only species of this genus reported in the literature to occur in warm and cold climates (Viafara et al. 1999) primarily as a pest of solanaceous crops (Gallego 1960, A.L.A.E. 1968, Sanchez 1973, Posada et al. 1981, Gallego and Velez 1992). Capps (1948) reported *N. elegantalis* from "San Antonio," department unknown, in Colombia.

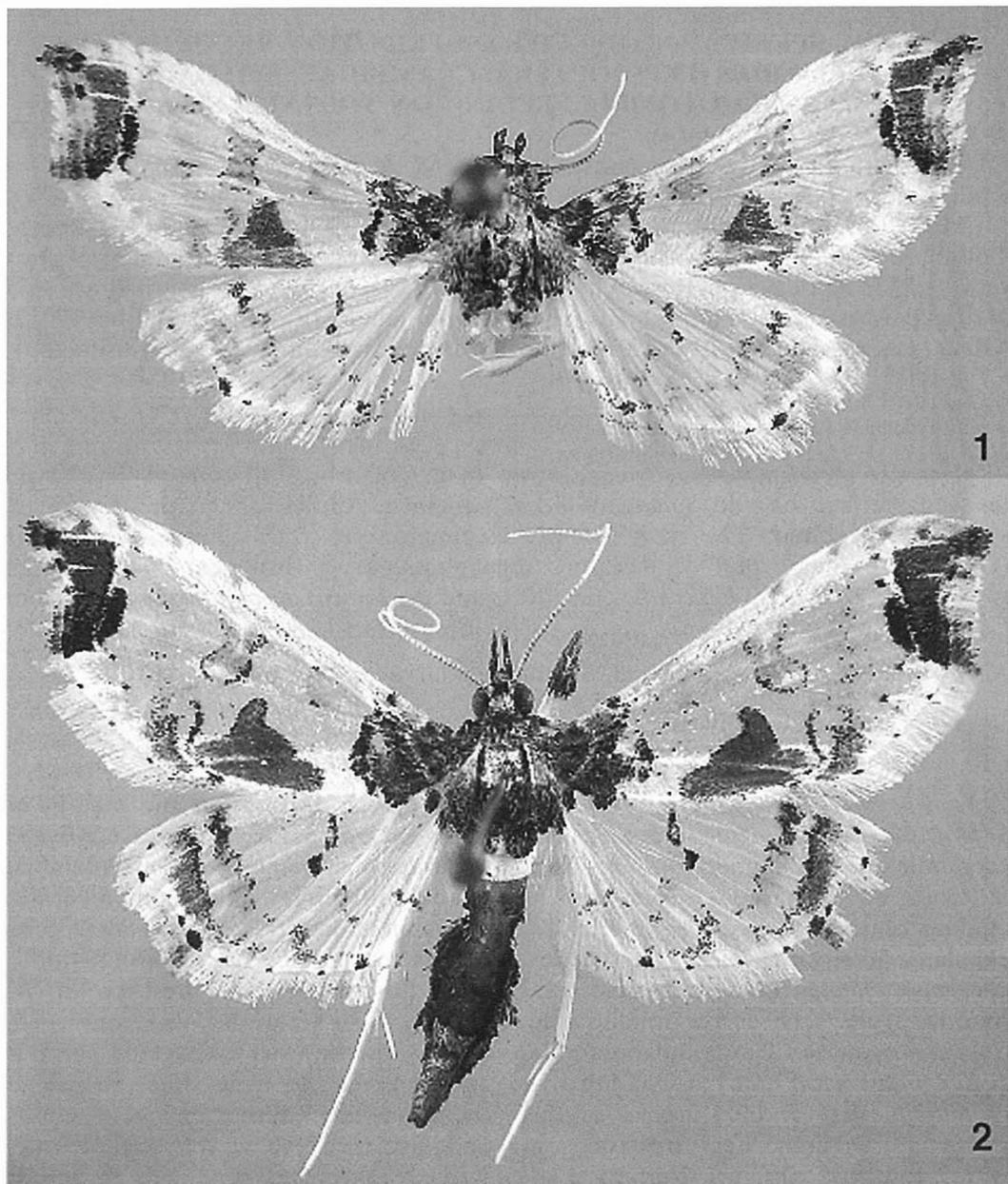
Capps (1948) described and revised *Neoleucinodes*, and described several new species and closely related genera. The first author (AED) conducted the first

study on the distribution and biology of *N. elegantalis* associated with cultivated and wild solanaceous species in Colombia. In addition, this is the only comprehensive re-examination of *Neoleucinodes* species and its description since Capps (1948).

In this paper, the presence of *N. elegantalis* in Colombia was confirmed, a new species was discovered, and is named here, and three other species of the genus were discovered. The adults and larvae of the new species are described below and compared to and/or differentiated from *N. elegantalis*.

MATERIAL AND METHODS

Solanaceous fruits infested with larvae were collected from 50 localities and 15 departments in Colombia and taken to the laboratory in Palmira (COPROICA). Fifty percent of the larvae from each locality were boiled and placed in vials



Figs. 1-2. Male adult dorsal view. 1, *Neoleucinodes silvaniae*. 2, *N. elegantalis*.

with 30% ethanol. The other fifty percent of the infested fruits were placed in separate rearing containers where larvae matured and pupated within cocoons in paper towels. After emergence, the moths were frozen, wings were spread, and specimens were labelled. The specimens are deposited at COPROICA in Palmira.

Eighty-eight male and female genitalic preparations (50% males, 50% females) were made from different species feeding on different host plants. The abdomen of the adult was removed, cleared in 10% KOH, transferred to 15% ethanol, and brushed to remove scales. Then they were stained with chlorazol black and the

excess color removed with clove oil. Before slide mounting in Canada Balsam, the clove oil was removed with HistoClear.

Observations were made using a Wild M5 dissecting microscope and a Leitz Laborlux-S compound scope. Measurements made using an external ruler (Wild Heerbrugg Switzerland – 310345) included female genitalic structures, forewing length, and labial palpal length. Specifically, the length of the bursa copulatrix (from the ostium bursae to the anterior end of the corpus bursae) and the length of A7, length from the ductus seminalis to the anterior end of the corpus bursae, from the intersegmental part of A8 to the anterior margin of the A7, and lengths of the anterior and posterior apophyses. A camera lucida was used to make sketches of the third labial palpal segment of the adults, and its length was indirectly measured from the drawing. The forewing length was measured from the base to apex, and the width was measured from the costal margin to posterior margin along the median line.

The following abbreviations are used: National Museum of Natural History, Washington, D.C. (USNM); Entomological Museum, Agronomy Faculty, National University of Colombia, Bogotá (UNAB); National Taxonomic Collection of Insect "Luis Maria Murillo" (CTNI). Morphological terminology is according to Munroe and Solis (1995) and Maes (1995) for the adults and Stehr (1987) for the larvae.

The diagnosis of the new species below includes only derived characters or synapomorphies. The adults of the new species were compared to closely related species from the Western Hemisphere of *Neoleucinodes* (*N. elegantalis* (Guenée), *N. dissolvens* (Dyar), *N. prophetica* (Dyar), *N. torvis* Capps, and *N. imperialis* (Guenée)), and to species in related genera, *Proelucinodes melanoleuca* Hampson, *P. xylopastalis* (Schaus). In addition, the adults were compared to

Euleucinodes conifrons Capps, and *Leucinodes orbonalis* (Guenée) from Africa, the latter a pest of solanaceous crops that has been intercepted at U.S. ports. Only the host plants and larvae of *N. elegantalis* and *L. orbonalis* are known, therefore the immatures of the new species were compared only to these two species.

RESULTS

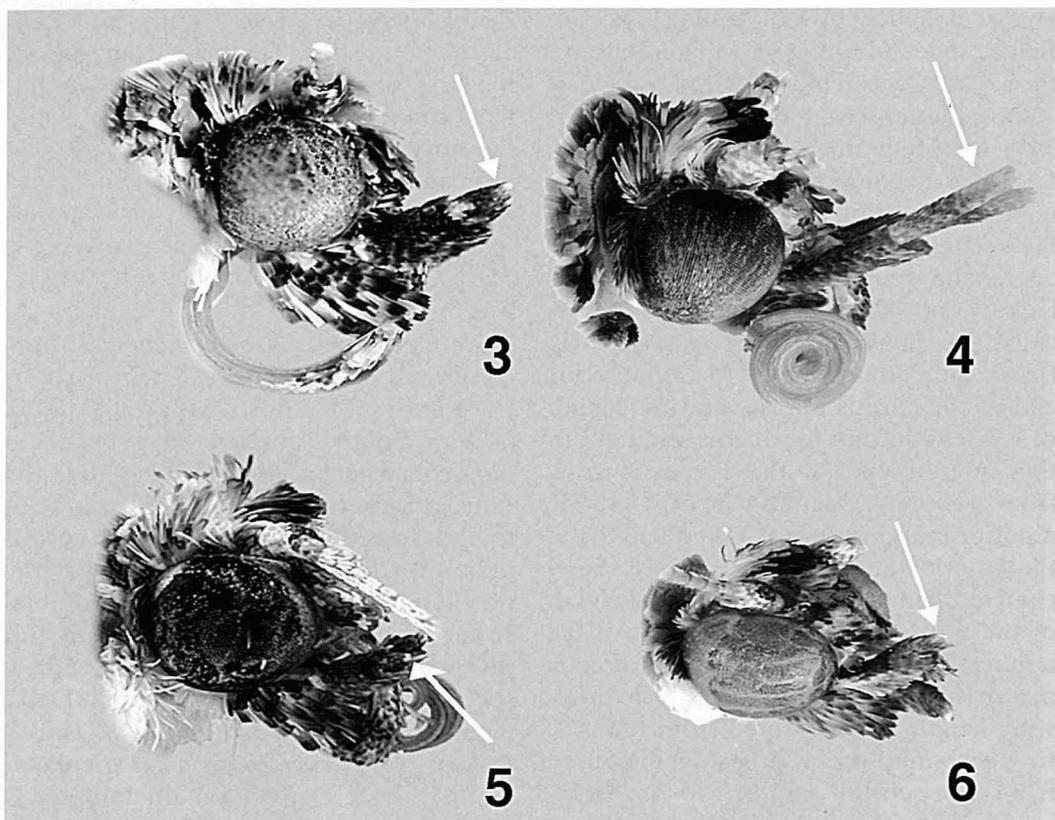
In Colombia, *Neoleucinodes* is now comprised of five species. Their distributions and known hosts within Colombia and in South America have been expanded. *Neoleucinodes elegantalis*, the only previously known species in Colombia, was collected in the three cordilleras of the Andean region and the northern Caribbean region of Colombia. It has been reared on five cultivated and seven wild solanaceous species. The new species described below, from Dept. Cundinamarca, was reared on *S. lanceifolium*; *Neoleucinodes prophetica* collected in Darién, Dept. Valle on January 5, 2006 at an altitude of 1,539 m was reared on *Solanum umbellatum* Mill; *N. imperialis* collected in Algeciras, Dept. Huila on February 15, 2006 at an altitude of 2,248 m. was reared on *Solanum subinerme* Jacq; and *N. torvis* collected from Jardín, Dept. Antioquia on February 9, 2006 at an altitude of 2,282 was reared on *Solanum rudepannum* Dunal.

Neoleucinodes silvaniae Diaz and Solis, new species

(Figs. 1, 7, 9, 11–12, 14, 16–19, 24–25)

Diagnosis.—Third segment of labial palpus in *N. silvaniae* short, less than 0.4 mm, in both sexes. Female scape red dorsally, male scape white dorsally. Abdomen grey and whitish. Forewing length 2.2 cm in females and 1.7 cm in males.

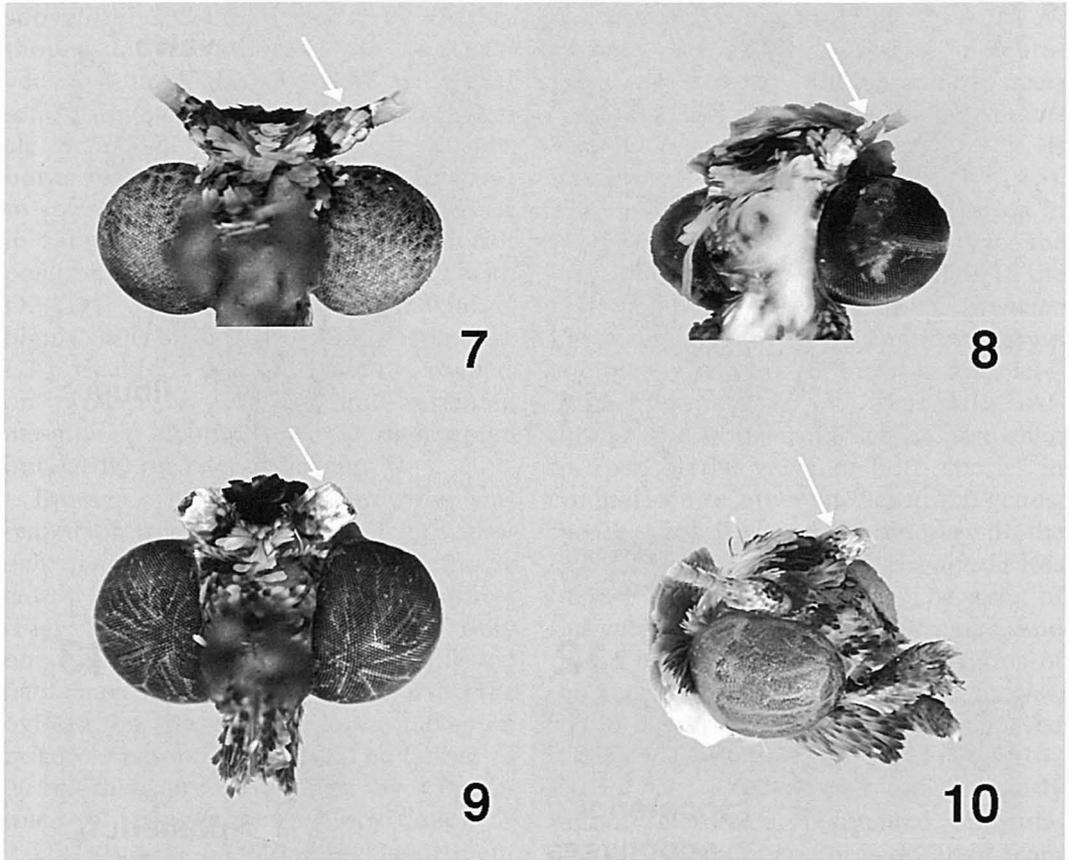
Adult.—*Head*: Frons round, red; ocelli posteriorly surrounded by white scales; chaetosema with red and white scales.



Figs. 3-6. 3, Female, *Neoleucinodes silvaniae*. 4, Female, *N. elegantalis*. 5, Male, *N. silvaniae*. 6, Male, *N. elegantalis* [arrow = third labial palpal segment].

Antenna with female scape dorsally red, laterally red and white; male scape white with some red scales dorsally (Figs. 7, 9). Labial palpus red; both sexes with third segment of labial palpus short. Third labial palpal segment in female = 0.4 mm ($n = 1$) (Fig. 3), in male = 0.1 mm ($n = 1$) (Fig. 5). Maxillary palpus short in both sexes. Patagium with red and white scales. Tegula mostly black with red scales, posteriorly with brown-tipped scales, reaching posterior margin of metathorax. *Prothorax*: Red, black-tipped scales, anterolaterally with two small black spots. *Mesothorax*: Scales red, black-tipped. Mesoscutellum with two tufts of red and black-tipped scales on anterolateral corners. *Meta-thorax*: Dorsally white with two tufts of red and black-tipped scales protruding

from each anterolateral side of metascutum. *Legs*: Front coxa with white, red, and yellow scales. Front femur white with red and black-tipped scales; front tibia with black scales on base and white scales on apex; front tarsus white and pretarsus with black empodium; mid- and hindlegs with white with some red scales on tibial base; last two tarsal segments yellow in color. *Wings* (Fig. 1): Forewing with hyaline scales, white at margins; length = 9.5 mm, width = 3.25 mm ($n = 4$); scales red, black-tipped at base of wing. Hindwing with black discal spot and postmedian line. Golden yellow at apex in radial area and at margin (Fig. 1). *Abdomen*: First tergite white, second and third tergites with varying amount of golden-yellow, red, and black scales, with some white at medial line

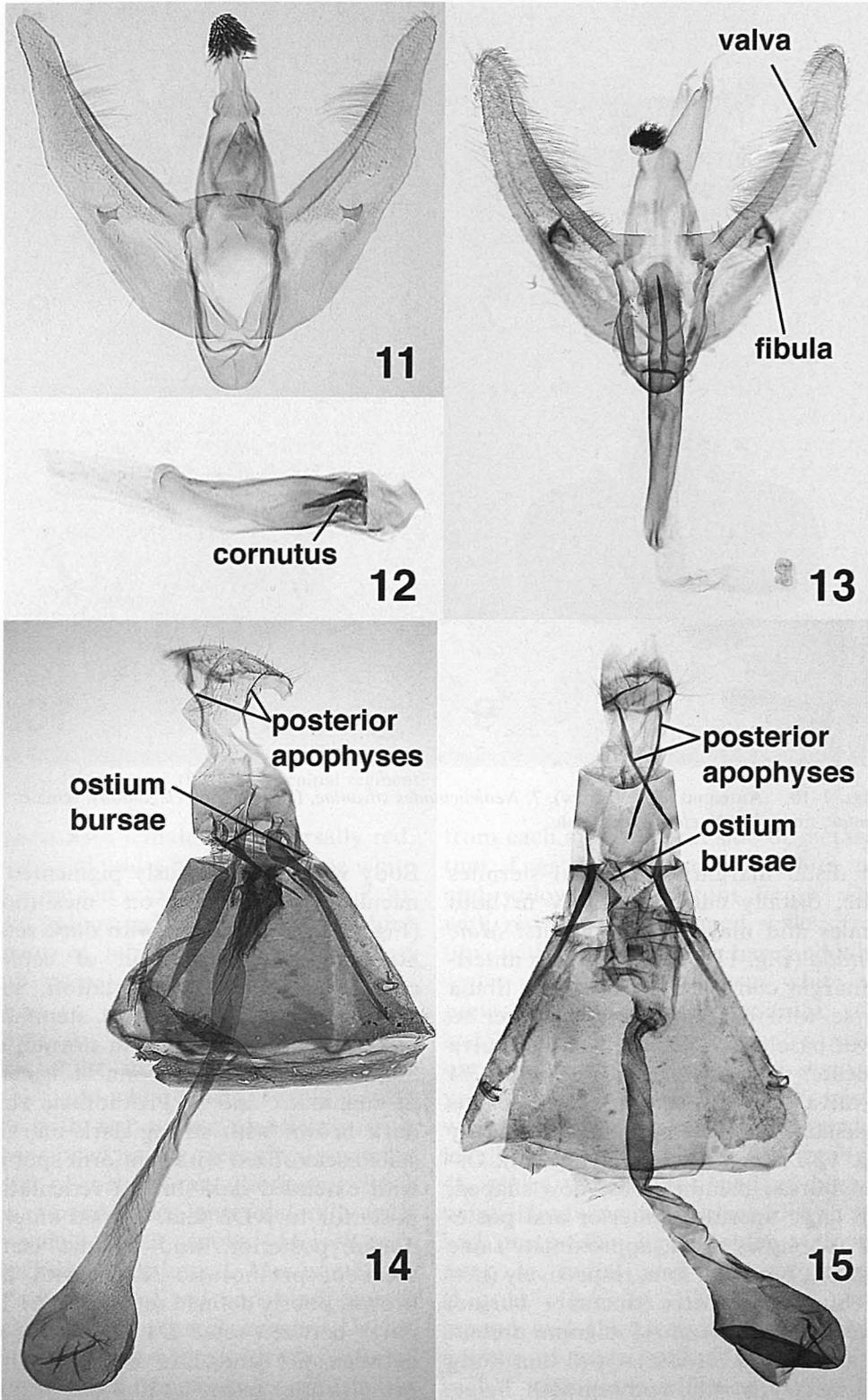


Figs. 7-10. Antennal scape (arrow). 7, *Neoleucinodes silvaniae*, female. 8, *N. elegantalis*, female. 9, *N. silvaniae*, male. 10, *N. elegantalis*, male.

and distal margin, abdominal sternites white; distally curved dorsally in both females and males of live adults. *Male genitalia* (Fig. 11): Tegumen with anterior margin completely sclerotized; fibula simple with base not hollow, closer to valval base than to apex. Apex of valva truncate, sclerotized costa extending 3/4 of valva length; cornutus of aedeagus bladeliike, curved slightly apically (Fig. 12). *Female genitalia* (Fig. 14): Ostium bursae membranous, bow-shaped, with large aperture; anterior and posterior apophyses short, approximate same length (0.7 and 0.6 mm, respectively ($n = 1$)); bursa copulatrix (ductus + bursae) three times length of A7; signum absent.

Larva (Figs. 16-19).—6-8 mm long (last instar) ($n = 1$), body smooth, beige.

Body with conspicuously pigmented pinacula, particularly on mesothorax (Fig. 16). Head yellow with dark reticulations. Posterior margin of cephalic capsule with black pigmentation. Stemma 2 closer to 1 than to stemma 3. Stemma black, arranged in normal arc. Seta S1 on median line connecting center of stemma 2 and 3. Prothoracic shield dark brown with strong dark marking, shield sclerotized with reniform spot and with extended dark brown reticulations posterior to XD2 seta. Dorsal anterior, dorsal posterior, and middle central areas of prothoracic shield with dark brown, poorly defined reticulations. Two pores between setae D1 and XD1, and between D1 and D2. Prothorax with prespiracular setae, L1 and L2, and two



Figs. 11–15. Genitalia. 11, Male *Neoleucinodes silvaniae*. 12, Male aedeagus *N. silvaniae*. 13, Male *N. elegantalis*. 14, Female *N. silvaniae*. 15, Female *N. elegantalis*.

subventral setae SV1 and SV2. Mesothorax and metathorax with one subventral seta, SV1. A3 to A8 with SD1 seta on pinaculum dorsal to each spiracle. Seta SD2 present and easily visible, borne on pigmented pinaculum anterior to spiracle (Fig. 19). Seta L1 close to L2 in same pinaculum below and anterior position in relation to spiracle. A9 with D2, D1, SD1 and L1, on same large, highly sclerotized pinaculum (Fig. 18); L3 present, L1 and L2 absent. Crochets on prolegs of A6 triordinal, oriented mesally; an incomplete circle, interrupted outwardly on lateral margin.

Biology.—*Neoleucinodes silvaniae* was reared on a wild solanaceous fruit, *Solanum lanceifolium* Jacq., called “uña de gato” in Spanish by the local farmers (Figs. 24–25). One fruit supports only one larva of *N. silvaniae*. The infested fruits have a scar that corresponds to the oviposition site, and the larva makes an exit hole before pupation. The larvae of *N. silvaniae* are parasitized by *Copidosoma* sp. (Hymenoptera: Encyrtidae).

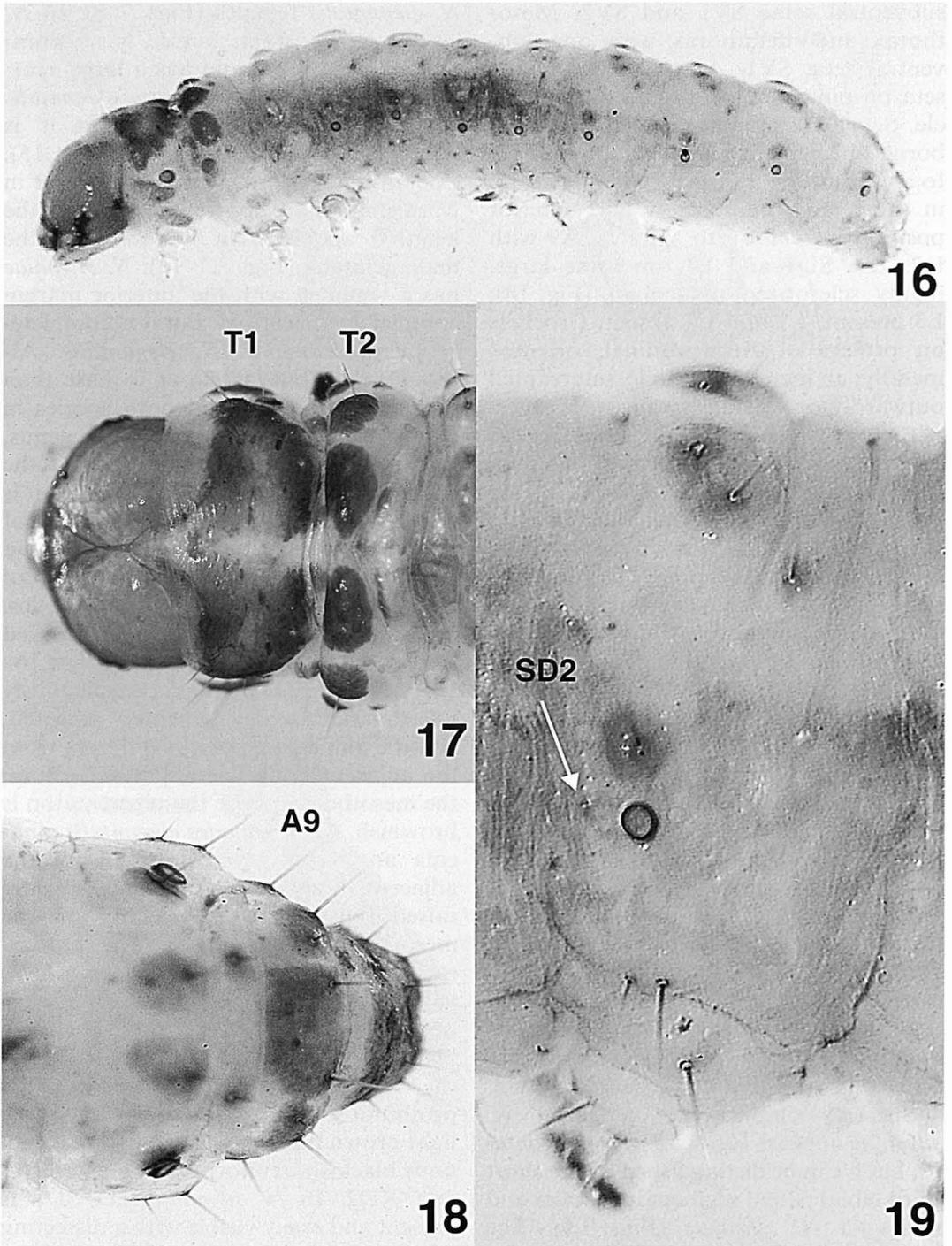
Distribution.—Colombia, Department Cundinamarca.

Type material.—Holotype male, Colombia, Cundinamarca, Vereda San Luis Bajo, Finca Villa Gloria. 4°42'15.2"N 74°37'6.41"W, 1,641 m alt., 24.ii.2005, Ex. *Solanum Solanum lanceifolium* Jacq. Collected by A.E. Diaz (Ana Elizabeth Diaz) [UNAB]. Paratypes: 5 ♂, 1 ♀ with same data as holotype [USNM, CTNI].

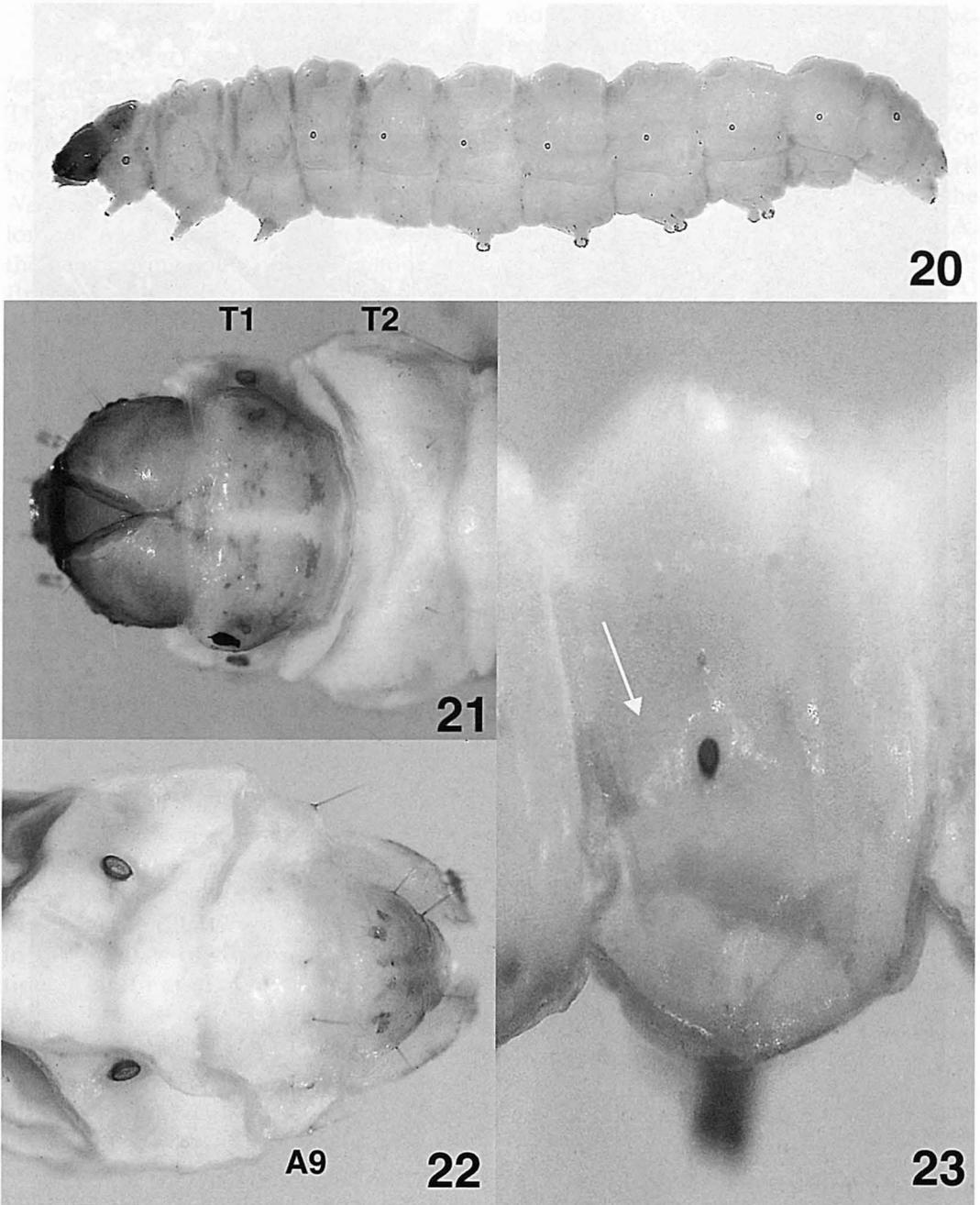
Etymology.—The species name *silvaniae* is the name of the municipality Silvania, where it was originally collected.

Species comparison.—Externally *N. silvaniae* appears identical to *N. elegantalis*, but it can be distinguished by the short third labial palpal segment in females and males of *N. silvaniae* (Figs. 3,5). The labial palpi in *N. elegantalis* are sexually dimorphic, the females have a long third labial palpal segment and in the males it is shorter (Figs. 4,6). The scape color is red in the females of *N. silvaniae*, but white in

N. elegantalis females (Figs. 7–8). In *N. silvaniae* the ostium bursae is membranous, bow-shaped, and has a large aperture (Fig. 14). *Neoleucinodes elegantalis* also has a large aperture, but it is sclerotized and cup-shaped (Fig. 15). The anterior and posterior apophyses in *N. elegantalis* are approximately twice the length of apophyses in *N. silvaniae*. In the male genitalia (Figs. 11–13), *N. silvaniae* has a tegumen with the anterior margin completely sclerotized, but it is completely membranous in *N. elegantalis*. Although the fibula is closer to base than to apex of the valva in both species in comparison to other species in the genus, the fibula of *N. silvaniae* is simple with the base not hollow, and in *N. elegantalis* it is bulky, with a hollow base. The apex of the valva is truncate in *N. silvaniae*, and round in *N. elegantalis*. The cornutus of the aedeagus is bladelike in both species, but in *N. silvaniae* the apex is less curved than in *N. elegantalis*. The larva (Figs. 16–19) of *N. silvaniae* has conspicuously raised, sclerotized, pigmented pinacula, and the pinaculum color is different from the adjacent body color, particularly on the mesothorax where the pigmentaton is brownish. *Neoleucinodes elegantalis* pinacula are usually concolorous with the adjacent body area and only slightly raised (blisterlike), particularly on the mesothorax (Figs. 20–23). The prothoracic shield of *N. silvaniae* is dark brown, with strong, dark markings, with a sclerotized reniform spot and with extended, blackish-brown reticulations posterior to the XD2 seta. In *N. elegantalis* the prothoracic shield is pale yellow with light brown markings, without a conspicuous blackish, reniform spot posterior to seta XD2. In *N. silvaniae* seta SD2 is present and easily visible with a dissecting scope on a pigmented pinaculum in front of the spiracle on A3 to A8. In *N. elegantalis* SD2 is present on A3 to A8, but they are difficult to see with a dissecting microscope and are not associated



Figs. 16–19. *Neoleucinodes silvaniae* larva. 16, Entire lateral view. 17, Mesothorax with pinaculum color different from adjacent body color. 18, Pinaculum of A9 with D2, D1, SD1 and L1 setae. 19, Seta SD2 visible (arrow) on pigmented pinaculum anterior to spiracle on A5.



Figs. 20–23. *Neoleucinodes elegantalis* larva. 20, Entire lateral view. 21, Mesothorax with pinaculum color different from adjacent body color. 22, Pinaculum of A9 with D2, D1, SD1 and L1 setae. 23, Seta SD2 not visible (arrow) anterior to spiracle on A5.

with a pigmented pinaculum. On A9 of *N. silvaniae* D1, D2, SD1, and L1 setae are on the same large pinaculum that is strongly sclerotized, but in *N. elegantalis*

D1 and D2 are separated from SD1 and L1; neither the pinaculum or adjacent area are visible, but are slightly raised (blisterlike).



DISCUSSION

The discovery of more species of *Neoleucinodes* in Colombia is not unexpected. The three species, *N. prophetica*, *N. imperialis*, and *N. torvis*, occur in neighboring countries. The only species of *Neoleucinodes* not yet discovered in Colombia, *N. dissolvens*, is known to occur in the neighboring countries of Ecuador and Brazil. One major reason for these new discoveries is probably due to the paucity of adult moths collected at lights, the most common method for collecting moths, from Colombia. Also, because species new to Colombia were found feeding on wild solanaceous plants and not on economically important plants, they were less likely to be found by rearing.

Knowledge of *Neoleuciodes* species, their distribution and biology, is important for the development of biological control programs for the tomato fruit borer. Colombian farmers use insecticide applications as the only control strategy for *N. elegantalis*, although there are natural enemies of *N. elegantalis* that could be used for biological control. In addition, insecticide applications have been shown to be inefficient due to differences for each crop in the behavior of the larvae (Da Costa Lima 1949), and in the manner of oviposition and pupation (Viafara et al. 1999).

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Figs. 24-25. Host plant of *Neoleucinodes silvaniae*. 24, Wild *Solanum lanceifolium* named by local farmers as "uña de gato." 25, Infested fruit with *N. silvaniae* larva.

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